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Characterization of Sesame (*Sesamum indicum* L.) Germplasm

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Abstract:- Characterization is the description of plant germplasm, which determines the expression of highly heritable characters ranging from morphological or agronomical features upto biochemical traits. The morphological characterization i.e. plant phenotyping is still under rapid development at the moment distinguishing proof and genetic improvement evaluation is most extreme significant input for field functionaries, seed certification agencies and crop breeders. Sesame is a member of the family Pedaliaceae and is considered as one of the most ancient oil seed crops, having the great diversity across the India. The present investigation was planned to evaluate the major eleven morphological characteristics viz., days to 50 per cent flowering, days to maturity, plant height, number of branches per plant, number of capsules per plant, number of seeds per capsule, length of capsule, 1000 seed weight, seed yield per plant, harvesting index and oil content in fifty-one sesame genotypes collected from all over the sesame growing regions of India. Genotypes IC-402056, EC-370343, IC-204049, AKT-101 and IC-203920 exhibited the high potential for seed yield, whereas, AKT-101, IC-204037, IC-203920 and EC-370402 recorded potential for high oil content. These genotypes identified as high yielding and potential sources for oil content, may be included in future sesame breeding programs.

Keywords:- *Characterization, Plant Genetic Resources, Sesame, Sesamum Indicum, Seed Yield and Seed Oil Content.*

I. INTRODUCTION

Sesamum indicum L. is globally used as a source of cooking oil and food since long time. Amongst the flowering plants, the genus *Sesamum* is having numerous wild relatives occur in Africa and a smaller number in India. It is widely naturalized in tropical regions around the world and is cultivated for its edible seeds, which grow in pods. World production in 2018 was six million tonnes, with Sudan, Myanmar, and India as the largest producers of sesame. Sesame belongs to family Pedaliaceae having chromosome number (2n = 26). Sesame is an annual crop with an erect, pubescent, branching stem and upto 1.20 meter tall. Sesame grown all over the India, it possess a wide range of variability and had number of distinct forms available all over the country. Sesame is better known as "Queen of oilseeds" by virtue of its quality edible oil and protein content. As it seed contains 50 per cent oil, 23 per cent protein and 15 per cent carbohydrate [10]. India (North Indian plain and Burma) and Abyssinia is the basic centre of origin and China as a secondary centre of origin for special endemic group of dwarf varieties [15].

The Plant Genetic Resources (PGR) refers to germplasm or genetic diversity of actual or potential magnitude existing among the individual plant or population belonging to specific crop species, having a important role in crop improvement is well known to experts in the field of plant breeding. It is assumed that the PGR facilitates the breeder by proving the raw materials for crop improvement in crop species. The characterization of germplasm lines via its morphological expression, biochemical or even molecular architecture is as essential information on the traits of germplasm lines constituting gene pool of specific crop assuring the maximum utilization of the germplasm collection to the crop breeders. The documentation of data on the important characteristics viz., yield, its contributing traits or oil content which distinguish accessions within a species, and even enables an easy and quick discrimination among phenotypes. This discrimination allows simple grouping of large number of accessions, development of core collections, identification of gaps and retrieval of valuable germplasm for further crop breeding programs, resulting in better insight about the composition of the collection and its genetic diversity of that crop. The success of any plant breeding programme depends on the extent of heritable variability existing in the material. Therefore, it is necessary to assess the extent of variation, which can be done through morphological characterization of available set of germplasm. The aim of present investigation was to regenerate/multiply and characterize sesame genetic resources based on seed yield, its contributing traits and oil potential.

II. MATERIAL AND METHODS

The present investigation was conducted using RBD design in three replicates during *Kharif* season of year 2019 at University Department of Agricultural Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with set of fifty-one sesame genotypes collected from all over sesame growing areas of country. The major morphological traits were identified based on past references which are important for economic yield. Eleven morphological observations were recorded and accordingly the germplasm is grouped into categories viz., high yielding, high oil content etc.

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Phenotype is a result of genetic constitution of individual and its interaction with environment, therefore the climatic conditions of location where the characterization is done has important factor for judging the potential of germplasm lines. The climate of Akola is subtropical semi-arid characterized by the three distinct season *viz*., summer becoming hot and dry from March to May, the warm and rainy monsoon from June to October and winter with mild cold form November to February. Akola is situated in the subtropical zone at the latitude of $20^0 42'$ North and longitude of 77^0 02' East. Altitude of the place is 307.41 m above the mean sea level. Average annual precipitation is 750 mm and the major amount is received during the period of June to September. Winter rains are few and uncertain. The normal mean monthly maximum temperature during the hottest month (May) is 46^0C while the normal mean monthly minimum temperature in the coldest month (December) is 10.7^0C. The mean daily evaporation reaches as high as 19.00 mm in the month of may and as low as 3.00 mm in the month of August.

III. RESULT AND DISCUSSION

Morphological characterization includes the set of morphological descriptors which are generally employed to describe the phenotype. Plant, stem, leaf, flower, pod and seed traits etc., specified for particular crop species can all be scored or measured and recorded in numeric values for further analysis. The analysis of variance was carried out to assess the variation in the genotype for all quantifiable characters under present investigation. The significance was tested by applying 'F' test, the analyzed data indicated that the treatment mean sum of squares found highly significant for all the characters, indicating the presence of substantial genetic variation among the genotypes (Table 1) [3,5,6,8,11 & 14].

Sr. No.	Characters	Mean Sum of Squares		
		Replications	Genotypes	Error
	Degree of freedom	2	50	100
1	Days to 50% flowering	2.52	795.35**	187.48
2	Days to maturity	6.13	816.01**	153.20
3	Plant height (cm)	188.61	11246.29**	3177.31
4	No. of branches per plant	1.75	85.53**	32.46
5	No. of capsules per plant	19.01	5022.36**	622.25
6	No. of seeds per capsule	29.62	2779.66**	534.24
7	Length of capsule (cm)	0.02	7.88**	1.04
8	1000 seed weight (g)	0.02	18.66**	0.39
9	Seed yield per plant (g)	0.61	116.33**	14.46
10	Oil content (%)	6.72	1362.83**	223.63
11	Harvesting index (%)	66.99	7731.66**	1369.70

*Significance at 5% level, **Significance at 1% level

Table 1:- Analysis of variance for eleven characters in fifty one sesame genotypes

The germplasm represented the high degree of diversification indicating the high potential for future plant breeding endeavors. The mean performance of fifty one sesame genotypes for eleven characters gives the general view of genotype. Wide ranges of variation were observed in the estimated means of all three replicates of an experiment for all the eleven characters studied in present investigation (Table 2 and Fig.1). The comparison of mean performance of fifty one genotypes for eleven traits using mean values of each genotype revealed very high level of variability in the genotypes used as experimental material in present investigation.

Among fifty one sesame genotypes, the genotype IC-402056 (4.98 g) was recorded highest seed yield per plant followed by EC-370343 (4.86 g), IC-204049 (4.61 g), AKT-101(4.51 g) and IC-203920 (4.39 g).

Sr. No.	Characters	Range
1	Days to 50% flowering	37.33 to 46.67
2	Days to maturity	87.00 to 99.00
3	Plant height (cm)	89.00 to 127.87
4	Number of branches per plant	1.87 to 5.47
5	Number of capsule per plant	15.73 to 38.53
6	Number of seeds per capsule	52.53 to 70.13
7	Length of capsule (cm)	2.03 to 2.93
8	1000 seed weight (g)	2.09 to 3.55
9	Seed yield per plant (g)	1.71 to 4.98
10	Harvesting index (%)	13.64 to 40.88
11	Oil content (%)	39.06 to 50.96

Table 2:- Estimated range for yield and yield contributing characters in sesame

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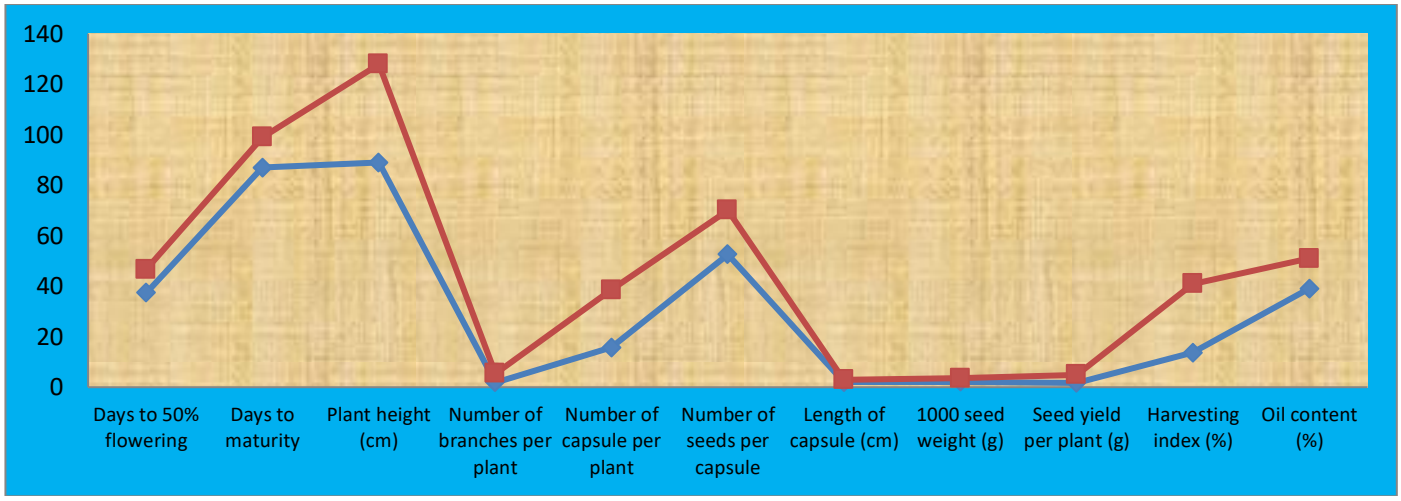

Fig 1:- Range of different morphological traits of Sesame

The earliest days to 50 per cent flowering were recorded for genotype EC-370364 (37.33 days) followed by IC-204065 (37.67 days) and EC-370344 (38.33 days) while, the earliest days to maturity of 87 days were recorded by IC-204041 and EC-370346. Short status of plant height was recorded for the genotype TKG-15-01 (89.00 cm) which was identified as dwarf genotype. The highest branching ability (5.47) among all the genotypes were recorded by EC-370373; IC-204062 followed by (5.33) branches exhibited in EC-370402 and ES-46-1. The maximum number of capsules per plant recorded by genotypes IC-402056 (38.53) and IC-204055 (36.67). While genotype AKT-101(70.13) was recorded the maximum number of seeds per capsule. The genotypes TKG-478 (2.93 cm), EC-370368 (2.90 cm) and TKG-15-2-1 (2.89cm) has maximum length of capsule. Maximum 1000 seed weight was recorded for genotype JLS-709-1 (3.55 g), TKG-523 (3.50 g) and EC-370343 (3.42 g). Among all the genotypes, the genotypes IC-204056 (40.88%) and EC-370343 (40.08%) recorded the maximum harvesting index while, the genotypes AKT-101 (50.96%) had exhibited the highest oil content followed by IC-204037 (50.05%) and IC-203920 (50.02%) which is statistically at par.

The available plant material in form of landraces, cultivars, wild relatives etc., represents the repository of a gene pool of that crop species. Whereas, the local adaptations of their domestic species, and thereby are used as a great source of genetic variations/ diversity. These kinds of variations at genetic level are helpful to plan breeding programs to mitigate the current and future food challenges. The presence of genetic variability in available genepool provides an opportunity for selecting superior genotypes, which can be obtained through vigorous screening and evaluation. Selection of superior genotypes based on yield alone would be ineffective. In order to make the selection criteria one has to put attention on yield contributing traits, which contribute yield in positive direction. The knowledge of association between the characters and their direct and indirect contribution towards expression of seed yield will be of an additional help to plant breeders in deciding the selection criteria.

As the *per se* performance cannot be the only criteria for selection program as the values of parent may not be noted in progeny, but it's provide the foundation for planning the future breeding program. Although there is need of further analysis at genetic level so that the perfect prediction of genetic potential of these genotypes can be done [3,4,7, 9,12,13&14]

IV. CONCLUSION

It could be concluded from present investigation that the morphological evaluation is the basic step for judging the potential of gentoypes available in any crop. Being a economically important crop, sesame genotypes were characterized morphologically under present investigation, and found that the lines viz., AKT-101 and IC-203920 found high potential for seed yield and for high oil content which can be utilized as a parent in hybridization programs for getting superior ideotype for seed and oil yield suitable for Vidharbha region.

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